

WHAT IS CLAIMED IS:

1. A storage system comprising:

a plurality of disks; and

5 a controller coupled to said plurality of disks; wherein:
said controller comprises a NAS controller and a SAN
controller;

said NAS controller receives an I/O command transmitted
by a computer to said storage system by way of a network as an
10 I/O command issued for a file unit;

said SAN controller receives an I/O command transmitted
by a computer to said storage system by way of a network as an
I/O command issued for a block unit and makes an access to data
stored in said disks on the basis of said I/O command issued
15 for a block unit;

said NAS controller converts an I/O command issued for
a file unit into an I/O command issued for a block unit and
transfers said resulting I/O command issued for a block unit
to said SAN controller; and

20 said SAN controller also makes an access to data stored
in said disks on the basis of an I/O command received from said
NAS controller as an I/O command issued for a block unit.

2. A storage system according to claim 1, wherein said

I/O command issued for a file unit is converted into said I/O command issued for a block unit by a command conversion program executed by a processor on said NAS controller.

3. A storage system according to claim 1, wherein a
5 disk-apparatus control program executed by a processor on said SAN controller operates without regard to whether or not an I/O command issued for a block unit is received from said NAS controller as an I/O command obtained as a result of converting an I/O command issued for a file unit.

10 4. A storage system according to claim 1, wherein said processor on said NAS controller communicates with a processor on said SAN controller through an internal bus connecting said NAS and SAN controllers.

5. A storage system according to claim 1, wherein said
15 NAS controller has a memory different from a memory employed in said SAN controller.

6. A storage system according to claim 1, wherein:
said NAS controller is mounted on said SAN controller;
and

20 said SAN controller processes an I/O command received from said SAN network as an I/O command issued for a block unit even if said NAS controller is mounted on or dismounted from said SAN controller in the course of an operation carried out

by said SAN controller.

7. A storage system according to claim 1 wherein, in order to access data stored in said disks, said SAN controller processes a SAN command issued for a block unit, taking
5 precedence of a NAS command issued for a block unit, or reversely processes said NAS command, taking precedence of said SAN command, wherein:

said SAN command issued for a block unit is an I/O command received from said SAN network; and

10 said NAS command issued for a block unit is an I/O command received from said NAS controller as a command resulting from conversion of an I/O command received from said NAS network as an I/O command issued for a file unit.

8. A storage system comprising:

15 a plurality of disks;

a NAS controller for receiving an I/O command issued for a file unit; and

a SAN controller for receiving an I/O command issued for a block unit;

20 wherein:

said NAS controller comprises a NAS communication controller, a NAS processor, a NAS memory and a NAS-memory controller for controlling said NAS memory;

said SAN controller comprises a SAN communication controller, a SAN processor, a SAN memory, a SAN-memory controller for controlling said SAN memory, an inter-processor communication controller for controlling a communication
5 between said NAS processor and said SAN processor and a disk controller for controlling said disks;

said NAS controller is mounted on said SAN controller;

said SAN controller processes an I/O command received by said SAN communication controller as an I/O command issued
10 for a block unit even if said NAS controller is mounted on or dismounted from said SAN controller in the course of an operation carried out by said SAN controller;

said NAS memory is used for storing also a command conversion program;

15 said SAN memory is used for storing also a disk-array control program;

said NAS processor executes said command conversion program to convert an I/O command received by said NAS communication controller as an I/O command issued for a file
20 unit into an I/O command issued for a block unit and stores said I/O command issued for a block unit in a communication-use area of said NAS memory;

said inter-processor communication controller transfers

an I/O command issued for a block unit from said communication-use area of said NAS memory to a communication-use area of said SAN memory; and

said SAN processor executes said disk-array control
5 program to catalog an I/O command transferred to said communication-use area of said SAN memory as an I/O command issued for a block unit as well as an I/O command received by said SAN communication controller as an I/O command issued for a block unit on a command queue, and makes accesses to data stored
10 on said disks through said disk controller on the basis of said I/O commands cataloged on said command queue as I/O commands each issued for a block unit.

9. A storage system comprising:

a plurality of disks; and

15 a controller coupled to said plurality of disks;
wherein said controller comprises:

a SAN interface controller for receiving an I/O command issued for a block unit from a SAN network;

a NAS interface controller for receiving an I/O
20 command issued for a file unit from a NAS network;

a SAN processor for making an access to said disks on the basis of an I/O command received by said SAN interface controller as an I/O command issued for a block unit; and

a NAS processor for converting an I/O command received by said NAS interface controller as an I/O command issued for a file unit into an I/O command issued for a block unit; and

5 wherein said SAN processor receives an I/O command issued for a block unit from said NAS processor as a command resulting from conversion of an I/O command issued for a file unit and also makes an access to said disks on the basis of said I/O command issued for a block unit.

10 10. A storage system according to claim 9, wherein said controller further comprises a memory used for storing:

a command conversion program for converting an I/O command issued for a file unit into an I/O command issued for a block unit; and

15 a disk control program for making an access to said disks on the basis of an I/O command issued for a block unit.

11. A storage system according to claim 10, wherein:

said NAS processor executes said command conversion program;

20 said SAN processor executes said disk control program; and

execution of said command conversion program by said NAS processor is independent of execution of said disk control

program by said SAN processor.

12. A data access method in a storage system, said method comprising the steps of:

(a) receiving a block I/O request from a SAN network in
5 a SAN controller;

(b) making an access to a disk in accordance with said block I/O request received in said SAN controller;

(c) receiving a file I/O request from a NAS network in a NAS controller;

10 (d) converting said file I/O request received in said NAS controller into a block I/O request;

(e) transferring a block I/O request resulting from conversion of a file I/O request from said NAS controller to said SAN controller; and

15 (f) driving said SAN controller to make an access to a disk in accordance with said block I/O request received from said NAS controller.

13. A data access method according to claim 12, wherein said step of converting said file I/O request received in said
20 NAS controller into a block I/O request is carried out by a command conversion program executed by a processor on said NAS controller.

14. A data access method according to claim 12, said

method further comprising the steps of:

(g) driving said SAN controller to catalog a block I/O request received from said SAN on a command queue;

(h) driving said SAN controller to catalog a block I/O request received from said NAS controller as a command resulting from conversion of a file I/O request on said command queue; and

(i) driving said SAN controller to make accesses to disks in accordance with said block I/O requests cataloged on said command queue.

15. A data access method according to claim 12, said method further comprising the steps of:

(g) driving said SAN controller to catalog a block I/O request received from said SAN on a SAN command queue;

15 (h) driving said SAN controller to catalog a block I/O request received from said NAS controller as a command resulting from conversion of a file I/O request on a NAS command queue; and

(i) driving said SAN controller to make an access to a disk in accordance with a block I/O request cataloged on said SAN or NAS command queue.

20 16. A data access method according to claim 15, wherein a block I/O command cataloged on said SAN queue is processed,

taking precedence of a block I/O command cataloged on said NAS queue, or wherein a block I/O command cataloged on said NAS queue is processed, taking precedence of a block I/O command cataloged on said SAN queue.